

**Center of Independent Experts Review of
Loggerhead Turtle Expert Working Group Report
August 4, 2008**

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Executive summary

The loggerhead Turtle Expert Working Group (TEWG) was convened by the National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC) to address the recent declines in loggerhead nesting in the U.S. The TEWG met in December 2006, April 2007 and September 2007. Review of this report by the Center of Independent Experts consisted of a desk review focusing on the adequacy and appropriateness of the data, methods and population models used to address the reasons behind the recent declines and to interpret the implications for the loggerhead population in the north Atlantic.

The major point of concern addressed by this working group is the precipitous decline in the number of loggerhead nests observed in nesting surveys in Florida since 1998. Loggerhead nests in Florida represent as much as 80% of all loggerhead nests and may produce up to 90% of all hatchlings. The index beach survey has monitored loggerhead nesting in a consistent manner from 1989 to the present. The number of nests in the survey peaked in 1998 at 59,918 nests and then declined to 28,074 nests in 2007. Declines have been noted in many other, albeit, smaller nesting areas in the U.S., Mexico, Central America, Caribbean, South America, Africa and sites in the Mediterranean.

The working group is to be commended for bringing together these many and diverse data sets to address the reasons for the recent declines in the number loggerhead nests observed during beach surveys. These data sets may be the best available but were found by the working group to be inadequate to address the underlying reasons for and the implications of the recent declines in loggerhead nesting.

Modeling of population trends based upon data from nesting surveys in the U.S. and Mexico only confirmed the declining trends but did not explain them. There does not seem to be enough reliable data to convert nesting counts to numbers of mature females in the population using remigration rates and the number of clutches/nests per females. Little monitoring information is available of any of the life history stages of females or males to allow the formulation of underlying reasons for declines in the number of nests or predict potential impacts on the population.

All of the research recommendations in the report are in support of obtaining better life history and monitoring information. It is unlikely that funding is available to cover all of the needs identified and priority areas will need to be defined according to obtaining the most benefit from immediate attention.

Background

The Turtle Expert Working Group (TEWG) concept was established by the National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC) in 1995 at the behest of NMFS to assess the status of turtle species in the Atlantic. The current loggerhead TEWG was initiated to address the recent declines in loggerhead nesting in the U.S. The TEWG met in December 2006, April 2007 and September 2007. The SEFSC has the lead for conducting stock assessments on Atlantic sea turtles, and assembled an international group of government scientists, academics, and NGOs to assess the status of loggerheads.

Review Activities

This review consisted of a desk review of one document, the Loggerhead TEWG (Turtle Expert Working Group) draft report (TEWG 2008) which was developed over a series of three meetings by the working group. Originally, the report was to be ready for review on April 25, 2008 with the CIE reviews to be submitted May 8 (Appendix 2). Delays ensued and the report finally arrived on July 15, 2008. This report (140 pages) contains the compilation and analyses of available data sets on north Atlantic loggerhead turtles many of which came from U.S. sources.

I augmented my review of this document with other papers and reports listed in the Reference section of this review. Websites where appropriate were also used and these are listed in footnotes.

Terms of Reference

- 1 Evaluate the adequacy, appropriateness, and application of data used in the assessment.
- 2 Evaluate the general adequacy, appropriateness, and application of methods used in the assessment.
- 3 Evaluate the adequacy, appropriateness, and application of the methods used to assess population status and trends.
- 4 Review research recommendations provided in the report and make any additional recommendations warranted.

Summary of the findings

The review of the TEWG report is organized according to the terms of reference laid out by the Center for Independent Experts.

1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.

The working group is to be commended for the thoroughness of their investigation of potential data sources for determining the status of the loggerhead turtles in the Atlantic. As to the adequacy of the data, I can not say it any better than the authors of this report who state that the existing data was "...woefully inadequate to determine the cause(s) of the declines in nesting ... or if those declines signal a decline in the adult population." Lack of information on the

distribution or variability of remigration rates and the numbers of nests per females makes it difficult to directly link declines in the number of nests to the decline in the number of females in the population. The tagging data mainly came from studies with a range of objectives, not all of them to do with the needs of this study. The stranding data were not very usable for the purposes of this study due the various issues discussed in the report (pages 30 to 37). The working group did the best that it could with the data at hand and was quite candid as to the limitations of using the data for the objectives of this report.

I looked into background material on the Florida nest survey program to understand the differences between what the authors have used here and what had been used in the 2007 leatherback TEWG report. On page 11 of the loggerhead report it states that there were 28 nesting beach surveys areas that had been consistently surveyed since 1989 in the Index Nesting Beach Survey (INBS) Program in Florida. Three more INBS beaches which have been surveyed in a consistent manner since 1997 are discussed in the section on the Northern Gulf of Mexico area. The Florida Fish and Wildlife Commission website¹ refers to 27 index beaches (excluding those added in 1997). The total number of nests for the 27 beaches is given as 45,080 for 2007² which is different than presented in Figure 1 of the loggerhead report and different than presented in the figure on the website¹. Are the index beach survey areas different from index beaches?

2. Evaluate the general adequacy, appropriateness, and application of methods used in the assessment.

I have interpreted this term of reference to refer to methods other than those covered in the following term of reference on methods to assess population trends.

In the appendix of the loggerhead report, models of the relationship between curved carapace length (CCL) and curved carapace width (CCW) which did or did not include an intercept were assessed by comparing R^2 values. Issues with the use of standard estimates of R^2 to discriminate between intercept and no-intercept models are well known in the statistics literature (e.g., Kvålseth 1985, Becker and Kennedy 1992, Anderson-Sprecher 1994). Overall, R^2 is not appropriate for discriminating between these two types of models. Specific tests for the intercept being equal to zero are available in most statistics books and computer packages. While it may seem reasonable to assume that CCL of zero should correspond to a zero for CCW, it is also likely that the relationship

¹ http://www.floridamarine.org/features/view_article.asp?id=27537

http://research.myfwc.com/engine/download_redirection_process.asp?file=Loggerhead_Nesting_Data__1990-2007.pdf&objid=2411&dltype=article

between these two measurements may not be the same or even linear near the origin. In this case, the recommendation in the text to not use the no-intercept model for measurements less than 15 cm CCL_{std} could be misguided and instead the intercept model could be recommended with the same proviso that it not be used for CCL_{std} of 15 cm.

While concerns about increasing variation in CCW with CCL could be dealt with by using a

logarithmic transformation, more flexibility and rigor could be obtained by fitting a generalized linear model with family equal to the gamma distribution and a log link. No explicit transformation of the data is required, hypothesis testing and confidence intervals etc., are straightforward. In particular, the degree to which the variance does increase with large size can be directly evaluated.

Assuming that CCW and CCL have a bivariate normal distribution (i.e., both random variables), the expected value of CCW conditional on a fixed value of CCL is the regression of CCW on CCL with maximum likelihood estimates of the regression parameters equivalent to those used in ordinary least-squares. Following this track then the authors' statement that they are mainly interested in predicting a CCW given a CCL and therefore use the "Model 1" approach of Y regressed on X is appropriate. Controversy over whether one uses Model 1 or Model 2 seems to occupy the biological literature but not the statistical literature where random effects, mixed effects and multilevel/hierarchical models are routinely employed for measurement error and far more complex situations.

3. Evaluate the adequacy, appropriateness, and application of the methods used to assess population status and trends.

Population trends inferred from nest counts for the loggerhead turtles were evaluated using the methods in Dennis et al. (1991). The standard regression approach and a Bayesian approach were used similar to the work reported for the leatherback turtles (TEWG 2007). The results of this analysis for areas where adequate data were available are presented in Table 2 of the current report.

It is not clear from the text that the regression results and Bayesian results are directly comparable. In the caption of Table 2, the P-level for the regression results are identified with a test of ϕ being "...statistically significantly different from one." This implies that the null hypothesis was $\phi=1$, versus the alternative hypothesis $\phi \neq 1.0$. On the other hand, the results for the Bayesian method are presented in terms of the probability of $\phi > 1.0$. If detection of population decline is the goal here, then the regression method should be testing the null hypothesis of $\phi \geq 1.0$ versus the alternative of $\phi < 1.0$ and the Bayesian probabilities should also be for $\phi < 1.0$.

The report states that for the Peninsular Florida beaches the analysis indicated an overall decline when using the entire 19-year dataset but a steep decline with a probability of 0.88 when only the last 10 years are used. The estimates of ϕ were 0.915 and 0.938 from the regression and Bayesian methods, respectively. What is the criterion for defining these rates as indicating a "steep" decline?³ Where does the probability of 0.88 come from? The table has a probability of 0.092 for $\Pr(\phi > 1.0)$, that is a probability of 0.908 for the probability of $\phi \leq 1.0$. However, if $\phi=0.938$ indicates a "steep" decline then the probability that ϕ is at most 0.938 is 0.5.

When discussing the results for the Northern U.S. beaches the authors switch from reporting λ to percentage decline, that is $100 \times (1 - \lambda)$. The rate of decline from the regression method was declared to be “... not significant ...” and a P-level of 0.120 was reported. Neither this report nor TEWG (2007) discuss the methods for calculating confidence intervals for λ but I assume that these were estimated using the exponential of the confidence intervals for r as per equation 68 of Dennis et al. (1991)⁴. Again it is not clear whether the P-value given in the table is for testing $\lambda < 1.0$, $\lambda \leq 1.0$ or $\lambda \neq 1$ but which ever it is, I have difficulty in reconciling this P-value with the confidence limits. The upper and lower bounds for λ are symmetric (despite being calculated from $\exp(r)$), that is 0.983 ± 0.021 . Taking $\exp(r \pm CI)$ changes the bounds but not the probabilities associated with the bounds. Assuming a one sided test of the null hypothesis $\lambda \geq 1.0$, the P-level implies that for the estimate of $\lambda = 0.983$, the probability of $\lambda \geq 1.0$ was 0.120, while the probability of $\lambda \geq 1.004$ was 0.025 based upon the confidence interval. Given the symmetric confidence interval, it is hard to believe that there was a probability of 0.095 between 1.0 and 1.004.

In Table 2 the Bayesian estimate for λ from the northern U.S. beaches was 0.986 with $\Pr(\lambda > 1) = 0.078$. In the text, the authors state that “...results of the Bayesian state-space model suggest that the decline was likely with a probability of 0.92 (Table 2).” Note that status-quo, i.e., $\lambda = 1$ is included in this definition of decline.

For Quintana Roo, λ was estimated to be 0.961 (18 year series, ~3.9% decline) by the Bayesian model with $\Pr(\lambda > 1.0) = 0.053$. The report concludes that the population was declining at this rate with a probability of 0.89. Based upon the entries in Table 2, the probability of decline (including status-quo) was $1 - 0.053 = 0.947$ and the probability that the population was declining at a rate of 3.9% or higher was 0.50. Where does 0.89 come from?

On page 13, the Bayesian state-space model was said to indicate a 91% probability that the population was declining for the 12 year case. The $\Pr(\lambda > 1.0)$ in Table 2 was 0.009 and therefore the probability of the population declining (including status-quo) was 0.991 not 0.91.

The population viability analysis presented in the document uses the same model as was used to evaluate trends in the population (ref. Dennis et al. 1991). The model is presented in some detail in this section of the report but should be presented earlier in the

³ On page 13 of the document a “steep” decline is defined as $> 5\%$ for Quintana Roo. ⁴ The confidence intervals presented in Dennis et al. (1991) are based on the normal distribution with known variance and are large sample asymptotic intervals which will be over-optimistic for the samples sizes presented in the loggerhead turtle report. The exact confidence intervals for the regression case are available in Bradu and Mundlak (1970). trends section. The authors reference a paper submitted for review by Snover and Heppell as

their source for defining Susceptibility to quasi-extinction (SQE) values using a bootstrap type of approach. The submitted paper appears to be for sea turtles in general but the loggerhead TEWG adopted a three-year running sum of nests based on this paper. In TEWG (2007) a three-year running sum was used to reflect a three-year remigration period for nesting females but the loggerhead report never mentions any assumptions about remigration. Is a three-year period appropriate for loggerheads? The U.S. Fish and Wildlife website⁵ states the remigration rates for loggerheads are generally two to three years but can vary from one to seven years. Details provided in Table 10 of the loggerhead report from Heppell et al. (2003) suggest a remigration rate of 2.5 years. Analysis of the tagging data presented on pages 84 to 85 suggested that four year cycles could be occurring as well. Note also that Holmes (2001) found using the running sum method can severely overestimate the variance when sampling error is present.

The impact of varying female mortalities on SQE was investigated. Although undefined, I assume that m_i represents additional females added or subtracted from the population. Given that the data are based on the number of nests observed, what was the assumption of the number of nests per female for this analysis? I assume that the number of nests per female may vary with age and experience but this was not mentioned as a consideration in the model.

The authors of the report considered five hypotheses to explain the declines in the number of nests. These were:

H1: The changes reflect natural variation or response to nesting increases of other species

H2: Life history parameters changed.

H3: Directed fisheries may cause or contribute to the decline.

H4: Bycatch in fisheries is the source of the decline:

H5: Shifts/changes in sex ratios impact productivity.

H6: Changes in current preferred habitats or preferred diet increase vulnerability to mortality by stage/age class.

There was very little information available to answer H1, H3 or H4. It was noted that there has been strong upsurge in nesting by green turtles and leatherbacks coincident with the decline of nesting by loggerheads in Florida (and a similar trend in Japan) but there is no evidence that the loggerheads have moved their nesting elsewhere. Directed fisheries appear to be of little importance now that Cuba has stopped fishing loggerhead. Data on loggerheads in the bycatch of other fisheries were judged to be minimal and a recent report (Wallace et al. 2008) continues to confirm this lack of data and analysis.

⁵ <http://www.fws.gov/northflorida/SeaTurtles/Turtle%20Factsheets/loggerhead-sea-turtle.htm>

With respect H2, there appears to be some evidence for a lower female survival rate for

Melbourne Beach based upon the tagging data but issues with the tagging data, unknown or inconsistent effort associated with the recaptures and the lack of data for all regions limit the conclusions that can be drawn from these data.

Evidence for changes in sex ratios⁶ was sought in the stranding data but the results and conclusions were qualified with many caveats as to the large number of untested assumptions that needed to be made to interpret the data. Note that the authors refer to accepting or rejecting null hypotheses in their investigation of the various possible patterns for sex ratios. For the frequentist basis of inference there is no mechanism for “accepting” a null hypothesis, instead these tests are set up to reject or not reject the null hypothesis. Not rejecting the null is not the same as accepting it in that evidence is usually gathered in an attempt to disprove the null, not to reinforce it.

The preliminary analysis of the tracking and sighting was well-done and informative to a point. However, given all of the caveats raised by the authors these data appear to have little information on potential changes in current preferred habitats and/or distribution.

4. Review research recommendations provided in the report and make any additional recommendations warranted.

Following is my summary of the research recommendations given in the report.

- 1 Determine stock/population structure through analysis and modeling of genetic samples collected continuously throughout the range.

2. Develop methods or expand on current programs to determine estimates of population abundance and trends for all life history stages.

- a. Establish a network of study sites in foraging areas, particularly along east coast of the U.S., Gulf of Mexico, Cuba, Yucatán Peninsula and in oceanic foraging areas. Studies in these areas to provide estimates of life history parameters.

- b. Expand or develop new satellite telemetry programs to estimate survival rates for life history stages not easily recaptured.

- c. Augment stranding data collection with forensic and necropsy parameter collection to address demographic parameters as well as mortality risks.

- d. Initiate or expand research on the operational sex ratios by subpopulation to understand the mechanisms that direct sex determination, the response of sex ratios to environmental variation and reasons for sex ratio shifting with respect to sex-specific behavior and seasonal migrations.

- 2 Determine the spatial and temporal distributions by life history stage to predict habitat use and connections between natal grounds and foraging grounds.

⁶ Confusing because ratios are not used, instead proportions of females were reported.

Knowledge of habitat use by life history stage is necessary to assess the potential threats from human and other impacts.

- 1 Expand research on the effects of bycatch on the population. This is both a domestic and international issue and collaboration among nations will to conduct this research is required.

2 Conduct or expand research on the diets of loggerhead turtles to address the impact of trophic changes.

Recommendations 1 through 4 seem straightforward enough but are fairly general in their goals as presented in the text of the report. Funds are likely to be limited for these kinds of research and it would be helpful if the authors of the report could define priority areas where they expect to get the most benefit from immediate attention.

Research recommendation 5 is my wording for the text in the subsection on “Trophic Changes/ Carrying Capacity”. This subsection needs to be rewritten to state precisely what research needs to be done and where it should be done. Currently, the message is simply that diet information is important.

Both recommendations 2a and 4 include the need for international collaboration. I assume that this need holds for all of the recommendations to some degree. I noted that 15 of the 16 members of the TEWG were representatives of U.S. organizations, universities and governments with the 16th member representing Mexico.

Respectfully submitted on 4 August 2008,

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Appendix 1: References

Anderson-Sprechler, R. 1994. Model comparisons and R^2 . Amer. Statist. 48: 113–117.

Becker, W. and P. Kennedy. 1992. A lesson in least squares and R squared. Amer. Statist. 46: 282–283.

- Bradu, D. and Y. Mundlak. 1970. Estimation in log-normal linear models. *J. Amer. Statist. Assoc.* 65: 198–211.
- Dennis, B., P.L. Munholland and J.M. Scott. 1991. Estimation of growth and extinction parameters for endangered species. *Ecological Monographs* 61:115–143.
- Heppell, S.S., L.B. Crowder, D.T. Crouse, S.P. Epperly, and N.B. Frazer. 2003. Population models for Atlantic Loggerheads: Past, present, and future, p 255–273. In: Bolten, A.B. and B.E. Witherington (eds.) *Loggerhead Sea Turtles*, Smithsonian Institution Press, Washington, D.C.
- Holmes, E. E. 2001. Estimating risks in declining populations with poor data. *Proceedings of the National Academy of Sciences.* 98: 5072–5077.
- Kvålseth, T.O. 1985. Cautionary note about R^2 . *Amer. Statist.* 39: 279–285. (and references therein)
- Turtle Expert Working Group. 2007. An assessment of the Leatherback Turtle Population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555, 116 pp.
- Turtle Expert Working Group. 2008. An Assessment of the Loggerhead Turtle Population in the Northwestern Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-xxx, xx p.
- Wallace, et al. 2008. Impacts of fisheries bycatch on loggerhead turtles worldwide inferred from reproductive value analyses. *J. Appl. Ecol.* 45: 1076–1085.

Appendix 2:

Statement of Work for Stephen Smith External Independent Peer Review by the Center for Independent Experts Loggerhead Turtle Expert Working Group Report

TEWG Project Overview

The National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC) convened a Loggerhead Turtle Expert Working Group (TEWG) to assess the status of loggerhead turtles in the North Atlantic Ocean. Scientists from NMFS, NGOs, and academia with expertise in loggerhead biology and data analysis comprised this group. All members contributed their expertise to the group, with the goal of producing a draft report that assesses loggerhead status in the Atlantic.

The TEWG concept was established by the SEFSC at the behest of NMFS in 1995 to assess the status of turtle species in the Atlantic. Previous TEWG reports addressed loggerhead turtle status in 1998 (TEWG 1998) and 2000 (TEWG 2000). The current loggerhead TEWG was initiated to address the recent declines in loggerhead nest in the U.S. The TEWG met in December 2006, April 2007, and September 2007. The SEFSC has

the lead for conducting stock assessments on Atlantic sea turtles, and assembled an international group of government scientists, academics, and NGOs to assess the status of loggerheads.

Overview of CIE Peer Review Process:

The Office of Science and Technology implements measures to strengthen the NMFS Science Quality Assurance Program (SQAP) to ensure the best available high quality science for fisheries management. For this reason, the NMFS Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable.

The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

Requirements for CIE Reviewers:

Three CIE reviewers are required to conduct a desk review (no travel is required) of a Loggerhead TEWG draft report (approximate length 120 pages), and each reviewer's duties shall occupy a maximum of 5 days to conduct the peer review and produce a CIE independent peer review report.

The CIE reviewers shall have expertise with current quantitative skill as it relates to an understanding of life histories and stock assessment of large, long-lived, highly migratory marine vertebrates. CIE reviewers shall expertise and experience with generating stock assessments in a data poor situation and in the use of count data as proxies for population size (e.g., number of nests for this report) and population growth rates. The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR herein.

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct an independent peer review of the TEWG loggerhead stock assessments to determine whether the best possible assessment was utilized through the TEWG process. The CIE reviewers shall conduct preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and deliverable dates as specified.

The reviewers shall evaluate the draft North Atlantic assessment report of the Loggerhead TEWG. Their primary responsibility is to conduct an impartial peer review to ensure that assessment results are based on sound science, and the CIE reviewers shall not comment on management decisions. The reviews shall consider whether the input data, assessment methods, and results are adequate and support the conclusions. If a reviewer finds the assessment to be deficient, then he/she shall recommend remedial measures, including an appropriate approach for correcting and subsequently reviewing the assessment. The evaluation shall explicitly address the following Terms of Reference.

Terms of Reference:

- 1 Evaluate the adequacy, appropriateness, and application of data used in the assessment.
- 2 Evaluate the general adequacy, appropriateness, and application of methods used in the assessment.
- 3 Evaluate the adequacy, appropriateness, and application of the methods used to assess population status and trends.
- 4 Review research recommendations provided in the report and make any additional recommendations warranted.
- 5 Prepare a Peer Review Report as described in Annex 1, summarizing the CIE Reviewer's evaluation of the Loggerhead TEWG report and addressing each Term of Reference, including a statement on whether the assessment was based on sound science, appropriate methods, and appropriate data, with a copy each sent to Dr. David Sampson at david.sampson@oregonstate.edu and Mr. Manoj Shivlani at shivlanim@bellsouth.net.

Schedule of Milestones and Deliverables:

10 April 2008	CIE shall provide the COTR with the CIE reviewer contact information, which shall then be sent to the Project Contact
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25 April 2008	The Project Contact shall send the CIE Reviewers the Loggerhead TEWG report
8 May 2008	Each reviewer submit independent peer review report to CIE
22 May 2008	CIE shall submit draft CIE independent peer review reports to the COTRs
5 June 2008	CIE shall submit final CIE independent peer review reports to the COTRs
11 June 2008	The COTRs shall distribute the final CIE reports to the Project Contact

Background References:

Turtle Expert Working Group. 1998. An Assessment of the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-409, 96 p.

Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC444, 115 p.

Acceptance of Deliverables:

Upon review and acceptance of the CIE reports by the CIE Coordinator and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE reports in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility to distribute the final CIE reports to the Project Contacts.

Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

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ANNEX 1

Format and Contents of CIE Independent Peer Review Report

- 1 The reviewer's report shall be prefaced with an executive summary of findings and/or recommendations.
- 2 The main body of the reviewer's report shall consist of a background, description of the review, summary of findings, and conclusions/recommendations. The summary of findings shall address each Term of Reference. Reviewers are also encouraged to provide any criticisms and suggestions for improvement of the TEWG process.
- 3 The reviewer's report shall include as separate appendices the bibliography of materials provided for the review of the Loggerhead TEWG draft report and a copy of the CIE Statement of Work.

Report prepared for the Center for Independent Experts System for Independent Peer Review

EXECUTIVE SUMMARY

The assessment report¹ assembles data on the populations of loggerhead turtles in the northwest Atlantic and presents results of analyses of the assembled datasets. Its main conclusions are that there are five genetically distinct stocks, that nest-count indices have decreased for most of them over the last ten years or so, and that over about the same period, recruitment to the neritic juvenile stage has decreased to very low current levels. The other analyses make little further contribution to these assessment conclusions.

The data assembled appear to be comprehensive. However, the data have apparently been collected on a basis of availability, not necessarily with a population assessment in mind, and not all the data are very helpful to the assessment. Analyses, such as they are, take the form of simple plots of the data or of simple hypothesis tests applied to one data set at a time. There is little attempt to build synthetic models of the population being assessed. Few conclusions are drawn from the data, and it is often unclear how the analyses carried out are relevant to the assessment. The report concludes that the data are inadequate to support a full assessment, but does not point out the most serious shortcomings or recommend how to make the situation better.

The report has problems of structure: its 'Executive Summary' is not a summary of the report, but apparently the report itself, and is too verbose to be considered a summary; the sections that follow give more the impression of being appendices to the 'Executive Summary' than that of composing a logically constructed assessment report; these sections deal with different types of data and are independently constructed; and the report makes little attempt to synthesise the different data sources.

The research recommendations are inconclusive. Although this section starts by proclaiming the inadequacy of the present data, it continues with a wordy suggestion to continue doing much the same as before.

a draft NOAA/NMFS Technical Memorandum 'An Assessment of the Loggerhead Turtle Population in the Northwestern Atlantic Ocean: A Report of the Turtle Expert Working Group'; 144 pp. dated July 2008.

INTRODUCTION

The document for review is a draft NOAA/NMFS Technical Memorandum 'An Assessment of the Loggerhead Turtle Population in the Northwestern Atlantic Ocean: A Report of the Turtle Expert Working Group'; 144 pp. dated July 2008. It consists of a series of sections, starting with 'Stock Structure' and proceeding essentially through different types of data on the species in question. These sections are preceded by an 'Executive Summary'. A major problem with the document is its structure. It is not clear as to what the 'Executive Summary' is to be considered a summary. It is not a summary of the rest of the document, and has no sound claim to be a summary of anything, being a verbose and discursive piece of writing.

It seems more as if the 'Executive Summary' is the assessment report itself, and the following sections compose a series of appendices. They are hardly linked or cross-referenced at all, and there is little overall synthesis of the information they contain. The 'Executive Summary', to which the following sections stand in the nature of appendices, does not refer in any orderly way to them, or appeal to their—rather scarce—conclusions to support its statements.

The report gives a strong impression of being a compilation of sections written by different people, with little in the way of overview or synthesis; and of being oriented around the gathering, and subsequently the analysis, of data, rather than an attempt to answer a specific set of questions and seek for information that will serve that end.

A stock assessment is a problem in population dynamics. The best quantitative assessments use mathematical models of population dynamics and fit them to appropriate data. Qualitative assessments use one or more accepted index series as a basis for judging the state of the stock. It is difficult to conclude from the document presented that the 'best possible assessment was used', as no recognisable stock-assessment format has been followed, and the most significant index series (apart from nest-survey data) have not been identified or interpreted. The individual sections analyse data sets and present numerical results, but in general without making clear which analyses are of population-dynamic significance or the relevance of their results to the aims of the assessment.

The report would be improved by the inclusion of an introductory section, laying out some of the necessary background on the distribution, biology, etc. of the species, but much more by a sound view of the assessment problem as a problem in population dynamics.

The 'Executive Summary' proposes a number of possible explanations for an observed recent decline in nest counts on nesting beaches in the south-eastern U.S. These are:

- natural variation in nest numbers;

- response to increased nesting by other turtle species;
- change in life history parameters;
- directed fisheries;
 - bycatch;
 - shift in sex ratio (in the adult population; if to males, then reduced numbers of females; if to females, then impaired fertilisation);
 - 'changes in current preferred habitats or preferred diet increase vulnerability to mortality by stage/age class' (quoted verbatim because uninterpretable).

Having proposed these hypotheses, the report comes to no clearly stated conclusions about them.

GENERAL COMMENTS ON THE DATA USED

The use of data appears to be comprehensive, in that, as far as this reviewer is aware, all available data have been assembled and examined. However, there appears to be a general problem that most of the data have not been collected with any specific objective, but simply because it is available. This imposes on the assessment scientists the necessity of critically examining the data to ensure that it is apt to their purpose, if necessary filtering the data or making selections from it, and explaining carefully the methods used to collect the data, its likely faults, and, if appropriate, the methods used for selection. In these respects the report is deficient. There is also the further problem that the analyses, such as they are, have been those suggested by the data, not by the problem, and generally the results of the analyses are difficult to interpret in the context of the assessment and make little contribution to it.

GENERAL COMMENTS ON THE ANALYTICAL METHODS USED

The statistical methods used are mostly quite simple. There is a great reliance on significance tests without explanation of how the critical levels were selected or what they mean, rather than an emphasis on seeking to summarise the data and demonstrate its salient features. In many cases there are large numbers of significance tests on small subsets of the data, and it would be more informative to build more comprehensive models capable of summarising the data and demonstrating the salient features of its structure. There appears to be no attempt to build, or examine the possibility of, a population-dynamic model for (any of) the populations considered.

But there are so many people collecting so many different types of data in different parts of the species' range and on different segments of its life history that some attempt to at least create the structure of a synthetic model to relate all the different quantities would be in order.

GENERAL COMMENTS ON THE REPORT

The structure is poor.

The report is long on description, but short on substance. The reader is irritatingly often sent elsewhere for important details on the methods used for collecting or analysing data, yet in spite of these frequent absences of significant detail, the report is quite long. Part of the problem is a failure to distinguish the relevant from the less relevant: Pages devoted to tabulating the settings of an algorithm for filtering ARGOS locations or detailing the equations for converting one size measurement to another are of marginal significance to the objective of this report.

The writing is not good, generally far too wordy, and reveals a deficient knowledge of English. In particular: the authors seem unaware of the distinction not only between 'censoring' and 'truncation' in statistical usage, but also between 'censor' and 'censure' in ordinary English; they are also (like many biologists) enamoured of the word 'bias' without being very precise as to its meaning; and the frequency of slips in syntax and spelling is excessive. 'The data suggest a steep decline with a probability of 0.88': what does this mean? Does it mean that there is an 88% probability that nest counts are decreasing, or an 88% probability that the decrease is 'steep'? And what does 'steep' mean, anyway? In nesting beach studies, we read that turtles were 'identified as putative neophyte nesters'. The word 'putative' means 'supposed', and it is difficult to 'identify' something as a supposed anything; 'supposed to be first-time nesters' would be appropriate.

The appendices are titled: Population Structure; Nesting Trends and Viability Assessment; In-water trends and size distribution; Spatial distributions; Life history and demographics; Directed harvests; Bycatch. Some present and analyse data, while others cite reports of analyses carried out elsewhere.

POPULATION STRUCTURE

Data: mitochondrial haplotype frequencies; microsatellite markers in nuclear DNA.

Methods: standard methods of genetic frequency analysis.

Results: five distinct populations in the northwest Atlantic: northern U.S., Peninsular Florida, northern Gulf of Mexico, Dry Tortugas/Cay Sal, Quintana Roo. Populations elsewhere, also

apparently distinct from the northwest Atlantic and from each other: Cape Verde Islands, Brazil, Greece, Turkey.

Comments: this appears uncontroversial and a standard method of assessing distinctions between populations.

NESTING TRENDS AND VIABILITY ASSESSMENT

Data: nest surveys from nesting beaches.

Methods: exponential regression of nest counts against time, using classical (least-squares) and Bayesian methods for fitting models. Stochastic extrapolation of regression lines as a 'population viability assessment'.

Results: most Atlantic loggerhead nesting populations have been decreasing over about the last 10 years; persistence of these decreases would put several of them at risk of extinction.

Comments: methods are in general poorly described or not described at all, and the reader sent elsewhere to find out about them, which is unsatisfactory. Nesting survey methods, including the sampling design for surveys that are not complete, are not described at all. No description of the regression models is given, nor of the priors used for the Bayesian fitting. For the methods used in the stochastic extrapolation of the regressions, the reader is referred to an unpublished and unavailable document.

Here, as generally elsewhere, there is a naïve reliance on significance testing without any attempt to show that the sampling and the experiment have been designed in such a way that the results of significance tests will have appropriate meaning. In the context of an assessment of this kind, statistical significance tests are generally inappropriate, and a 'weight-of-evidence' approach is to be preferred, and is better provided by the Bayesian analyses.

It is not stated whether the loggerhead turtle is a synchronous periodic nester. From the nest-count figures it doesn't appear to be, and the analyses of nest-count data make little mention of correcting the mean squared error for the correlation of residuals that synchronous nesting induces.

The description of the methods for the stochastic extrapolation of the nest-count regressions is strikingly unclear. Considering that two pages of text are devoted to explaining the methods, the reader is left with very little idea of how the extrapolations were executed. If the same amount of space were to be assigned to describing in logical sequence the parameter estimates used and the algorithms applied to the stochastic extrapolation, it would be more profitable. The authors make much use of the word 'bootstrap', which is properly applied to the re-sampling of data. It is not clear that they do not mean 'Monte Carlo simulation'; if they do mean 'bootstrap', it would be helpful to know what data are being re-sampled.

IN-WATER TRENDS AND SIZE DISTRIBUTION **Data:** size data, and in some cases catch rates, from accidental (apparently live-) captures, including those in a power plant cooling system and several kinds of nearshore fishing gear, a nearshore trawl survey, and beach-cast dead or injured turtles; also some reference to a small, and somewhat sporadic, aerial survey in Chesapeake Bay.

Data and data collection methods are not described; fishery sampling in Pamlico Sound is not described (how many fishermen, sampling rate, etc.)

Methods: the use of catch, or catch rate, data is limited to plots against time. Sizes are plotted as frequency functions, dataset by dataset. The size range plotted is limited to 40–110 cm, whether by truncation or because turtles outside that range do not occur in the data is not quite clear. **Results:** catch rates seem generally to have increased, in the power-plant data quite markedly, up to about 2004, but to have decreased from that peak in the most recent years. The length mode in the plotted range is 5–10 cm greater since about 2000 than before, accompanied by, and apparently not entirely owing to, a continued drop in the proportion of turtles shorter than 55 cm since 1994 to, presently, very low values. **Comments:** data collection methods are inadequately described. The different data sets agree moderately well with one another, both as regards catch rates and size distributions. If relative vulnerabilities to capture remain

constant over time changes in the length distribution in the captures should reflect corresponding changes in length distribution in the nearshore population. However, very little of the length data considered here relates to turtles of reproductive size, and the relationship of changes in size distribution of immature turtles to a drop in nest counts is not clear. Some attempt to link size to age by a growth curve would appear to be overdue.

‘SPATIAL DISTRIBUTION’ (MOVEMENTS, FROM TAGGING, AND SURVEYS) **Data:** conventional (recovery) tags, limited to 3777 tags applied on the Atlantic coasts of North America and subsequently recovered; also tracks from 248 satellite-linked radio tags. For recovery tags, the tagging methods are not described, including the sampling designs and tagging opportunities: whether exclusively, mostly, or only partly nesting females, or what other tagging opportunities are taken or created and what proportion of tagging or recoveries they account for. Satellite tags were put on juveniles and adult females mostly in Georgia and further north on the U.S. east coast, but on males mostly in Florida. For some reason, the document includes 2 pages of marginally relevant tabulations of the settings used to filter ARGOS locations, but little information on the tagging locations, the data transmitted by the tags, &c.

Assembled data from a number of different, mostly aerial, survey programmes is also used to describe seasonal distributions. **Results:** tags are most often recovered in the region where they were applied, the few recovered elsewhere are usually recovered in adjacent regions. Satellite tracks showed that most turtles remain near shore (within the 200-m isobath), although juveniles ranged more widely offshore in what appears to be a well-defined plume east and somewhat north of the mid-Atlantic states. In winter, turtles are not found near shore north of C. Hatteras.

Survey data confirm that the coastal distribution in winter is restricted. **Comments:** tagging data confirms that the identified populations are largely distinct.

There is some interest in how surface time varies with season; it would seem possible that tags might transmit water temperatures at the surface and perhaps at some other defined depths.

The use of survey data to describe distribution seems confounded by the limited coverage of the surveys, especially south of C. Hatteras. Survey sightings north of C. Hatteras conform less well to the distribution of survey effort and are more informative about the limits of turtle distribution.

The description in the document of how survey data can be used seems confused. The last paragraph of the survey section says: ‘Differences in

seasonal surfacing behaviour (sic: the authors intend ‘Seasonal differences in surfacing behaviour’) may bias (affect) density estimates’. However, density estimates are not used in this document, and if differences are only seasonal, the seasonal distributions should be unaffected. A more pertinent concern would be whether local or regional differences in water temperature (or other environmental variable) affect surfacing behaviour and therefore availability and the apparent distributions. It would seem likely that habitat use and behaviour do affect surfacing and therefore availability, which would also bias the appearances of distribution. The concentration on density estimates in this paragraph seems misplaced, seeing that they do not appear.

LIFE HISTORY Data: (by inference) size data from unspecified sources; marking and tag-return data, as well as size data, from nesting beach monitoring; sex data for hatchlings from a number of regions; sexratio data for ‘juveniles’ (undefined) from several sources (sampling methods not specified); sex and length data for beach-cast turtles, leading to sex-ratio estimates for a set of defined length classes. **Results:** a size distribution from one near-shore capture data-set and statistical parameters of size distributions for supposed first-time nesters on several beaches are presented. (The size distribution of repeat nesters is not considered, and I would have expected it to be of at least some interest, if only for comparing with that of supposed first-time nesters.) Several pages later, these are used in some rules for classifying turtles by length, these classes then being used in analysing sex ratios.

Nesting-beach tagging results are used to distinguish (supposed) first-time nesters from (supposed) repeat nesters and to estimate survival rates for mature (i.e. nesting) females. It is not stated whether the survival rates are annual or per breeding period; in this section we also find that loggerheads do have a multi-year nesting cycle and four years is mentioned as a value supported by some of the data. **Comments:** the initial discussion of life history stages is not justified at its start and in the end goes nowhere significant, and the only useful *definitions* of stages crop up several pages later. As far as I can make out, the stage definitions correspond to:

1. length less than 15 cm;
- 1 length over 15 cm, less than the mean length of stage 3, and not in stage 3; presumed not in stage 3 because living offshore;
3. susceptible to capture by the (unspecified) methods used nearshore by the NMFS in North Carolina;
 larger than the mean of stage 3 and not in stage 3 or stage 5;
 reproducing adults.

A significant, but unstated, assumption appears to be that the sampling methods used by NMFS in N. Carolina (N.C.) define, without sampling bias,

the lower limb of the size distribution of neritic turtles, but that the upper limb of the N.C. size distribution is generated by sampling bias, and that there exist neritic juveniles that are not captured by these methods. However, the definition in the top line of Table 10 of these older juvenile stages as ‘oceanic or neritic’ raises questions as to whether the N.C. size distribution can be used to define a stage boundary. The existence of a well-defined left-hand limb for the size distribution in the N.C. nearshore data is not necessarily fully informative about the right-hand limb of the distribution of sizes of oceanic juveniles. This report refers to a conclusion, from an analysis of length data, that ‘recruitment to the neritic stage is nearly complete by 59.5 cm SCL’, but without saying what lengths were analysed or how the data were gathered. Such a conclusion would need to be supported by analysis of lengths of turtles caught offshore by unbiased methods.

The left-hand limb of the distribution of reproducing adults has been generated by the distribution of sizes of supposed first-time nesters; there is no reason not to use the size distribution of all nesters, repeats as well as first-timers, especially since first-time nesters are not reliably distinguished from repeat nesters.

The analysis of tag data by mark-recapture methods (again, not well described) probably needs some careful examination to ensure that the assumptions of the analysis methods are met in the data. Tag loss and failure to distinguish first-time nesters from repeat nesters might be significant problem factors. The survival estimates presented here are astoundingly low, if they are annual rates and not nesting-interval rates. Annual survival at 80% implies a life *expectancy* of 5 years, which for a marine turtle, a member of a group of supposedly long-lived species, seems unlikely. Table 10 shows 22 to 35 years to reach adulthood; adult life expectancy of 5 years after such a long-delayed maturity is *prima facie* inconsistent and unlikely. Such low survivals might be consistent with the rather low proportions of repeat nesters shown in Table 13, but these proportions might not be accurate.

Analysis of sex ratios, again, returns to a series of hypothesis tests for which, again, the motivation is that they are available. Sex ratios are analysed for a length range thought to be exclusively immature and for one, or two, thought to be exclusively adults; however, since these are only length classes, there is no reason not to look at sex ratios in the length range in between, which might be informative. As far as I could make out, the sex-ratio analyses have been carried out exclusively on a dataset of beach-cast carcasses, and therefore are ratios of deaths, not of the live population, and may not be unbiased estimates even of that, depending on sex-related differences in distribution, buoyancy, susceptibility to different hazards, and other factors. However, the various discussion paragraphs don’t seem to hold that clearly in mind (‘they may better represent the secondary sex ratios of turtle assemblages. . .’—p.90.) The length-specific sex composition of deaths will only reflect the sex ratio in the standing stock if death rate and stranding rate at that length are the same for both sexes. All turtles will die sooner or later, and if hatchlings are preponderantly female (cf. Table 14) then over the entire age range deaths will also be preponderantly female. *If* strandings are unbiased for sex, clues to a

varying sex ratio with size in the live population are to be found not in the stranding sex ratio *per se*, but in its variations from the expected overall female preponderance. In connection with stranding sex ratios, the report uses the word 'bias' rather freely, but the authors appear to be referring to the overall female preponderance rather than to length- (or area-, or season-) related *deviations* from this overall proportion, which is what 'bias' truly connotes.

It is a bit odd that this whole section is called 'Life History' but seems so much concerned with sex ratios and not at all with length composition. Surely an analysis of the distribution of lengths in the strandings would be of at least some interest?

DIRECTED TAKES

Data: data from a past Cuban fishery.

Results: the directed fishery in Cuba may have affected population status in the past but has been closed.

Comments: no data from directed fisheries in other jurisdictions.

BY-CATCH

Data, Analysis and Results: none.

Comments: it passes belief that a document calling itself an assessment of the species should state that loggerheads are by-caught in numerous fisheries, can list 15 documents dealing with by-catch, all produced in the present decade, and then cite not a single value from any of them. Not an order of magnitude, a general statement about which length classes are most affected—nothing.

RESEARCH NEEDS AND RECOMMENDATIONS.

This section starts by finding the data ‘woefully inadequate’ to determine the causes of the declines in nesting, but proposes no definite remedies. The assessment has not concentrated on the population-dynamics problem, any kind of synthetic model, or looked at the sensitivity of any conclusions to assumptions about the data or about its completeness or precision, and therefore is not well placed to make proposals. The reviews and analyses of the different kinds of data available have not identified which ones could contribute better to a population assessment, or how they would need to be improved in order to do so. Even where the report names a specific lacuna in the data—‘the Florida researchers did not believe that they had intercepted a sufficient proportion of females to [estimate the proportion of first-time nesters]’—this section does not specifically recommend doing anything about it. The overall tone of these two pages is ‘Everything being done is valuable and useful, so let’s carry on doing it’, in spite of the leading statement that the available data is not giving the answers.

It appears that there are four major life-history events: egg-laying (nesting); hatching; recruitment from the oceanic juvenile stage to the neritic juvenile stage, and recruitment from the neritic juvenile stage to mature reproductive adults. The present attempt at an assessment is hampered by a lack of quantitative information particularly about the last two.

A short list of priority research topics might be:

- 1 Improve sampling design, effort, coverage, and techniques for tagging on nesting beaches to obtain statistically sound estimates of rate of recruitment to nesting-female populations, size of nesting-female populations, nesting longevity and survival of adult females, re-migration interval, and trans-migration frequency; investigate how re-nesting interval, nests per nesting year, eggs per nest, vary over time or are affected by other (individual, environmental or population) factors.
- 2 Develop programmes to monitor and estimate the rate of recruitment to the neritic juvenile stage.
- 3 Investigate, and if feasible inaugurate, a programme for collection of specimens and data from turtles by-caught in fisheries, including location, size, and sex.
- 4 SPO tag 65–75-cm turtles to follow their movements with a view to finding out why they become less available to the present nearshore monitoring methods when they exceed 80 cm in length; develop methods for monitoring the numbers of the entire neritic juvenile segment.
- 5 Given a defined offshore distribution of juveniles from satellite-linked radio-tag locations, assemble oceanographic data and analyse conditions in this area with a view to finding out what limits this distribution.

Appendix I. Bibliography of Materials Provided

Turtle Expert Working Group. In prep. An Assessment of the Loggerhead Turtle Population in the Northwestern Atlantic Ocean. *Submitted as* NOAA Technical Memorandum NMFSSEFSC-xxx.

Appendix II. Statement of Work.

External Independent Peer Review by the Center for Independent Experts

Loggerhead Turtle Expert Working Group Report

TEWG Project Overview

The National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC) convened a Loggerhead Turtle Expert Working Group (TEWG) to assess the status of loggerhead turtles in the North Atlantic Ocean. Scientists from NMFS, NGOs, and academia with expertise in loggerhead biology and data analysis comprised this group. All members contributed their expertise to the group, with the goal of producing a draft report that assesses loggerhead status in the Atlantic.

The TEWG concept was established by the SEFSC at the behest of NMFS in 1995 to assess the status of turtle species in the Atlantic. Previous TEWG reports addressed loggerhead turtle status in 1998 (TEWG 1998) and 2000 (TEWG 2000). The current loggerhead TEWG was initiated to address the recent declines in loggerhead nest in the

U.S. The TEWG met in December 2006, April 2007, and September 2007. The SEFSC has the lead for conducting stock assessments on Atlantic sea turtles, and assembled an international group of government scientists, academics, and NGOs to assess the status of loggerheads.

Overview of CIE Peer Review Process:

The Office of Science and Technology implements measures to strengthen the NMFS Science Quality Assurance Program (SQAP) to ensure the best available high quality science for fisheries management. For this reason, the NMFS Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized

for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

Requirements for CIE Reviewers:

Three CIE reviewers are required to conduct a desk review (no travel is required) of a Loggerhead TEWG draft report (approximate length 120 pages), and each reviewer's duties shall occupy a maximum of 5 days to conduct the peer review and produce a CIE independent peer review report.

The CIE reviewers shall have expertise with current quantitative skill as it relates to an understanding of life histories and stock assessment of large, long-lived, highly migratory marine vertebrates. CIE reviewers shall expertise and experience with generating stock assessments in a data poor situation and in the use of count data as proxies for population size (e.g., number of nests for this report) and population growth rates. The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR herein.

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct an independent peer review of the

TEWG loggerhead stock assessments to determine whether the best possible assessment was utilized through the TEWG process. The CIE reviewers shall conduct preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and deliverable dates as specified.

The reviewers shall evaluate the draft North Atlantic assessment report of the Loggerhead TEWG. Their primary responsibility is to conduct an impartial peer review to ensure that assessment results are based on sound science, and the CIE reviewers shall not comment on management decisions. The reviews shall consider whether the input data, assessment methods, and results are adequate and support the conclusions. If a reviewer finds the assessment to be deficient, then he/she shall recommend remedial measures, including an appropriate approach for correcting and subsequently reviewing the assessment. The evaluation shall explicitly address the following Terms of Reference.

Terms of Reference:

- 1 Evaluate the adequacy, appropriateness, and application of data used in the assessment.
- 2 Evaluate the general adequacy, appropriateness, and application of methods used in the assessment.
- 3 Evaluate the adequacy, appropriateness, and application of the methods used to assess population status and trends.
- 4 Review research recommendations provided in the report and make any additional recommendations warranted.
- 5 Prepare a Peer Review Report as described in Annex 1, summarizing the CIE Reviewer's evaluation of the Loggerhead TEWG report and addressing each Term of Reference, including a statement on whether the assessment was based on sound science, appropriate methods, and appropriate data, with a copy each sent to Dr. David Sampson at david.sampson@oregonstate.edu and Mr. Manoj Shivilani at shivlanim@bellsouth.net.

Schedule of Milestones and Deliverables:

27 March 2008	CIE shall provide the COTR with the CIE reviewer contact information, which shall then be sent to the Project Contact
11 April 2008	The Project Contact shall send the CIE Reviewers the Loggerhead TEWG report
25 April 2008	Each reviewer submit independent peer review report to CIE
8 May 2008	CIE shall submit draft CIE independent peer review reports to the COTRs

22 May 2008	CIE shall submit final CIE independent peer review reports to the COTRs
28 May 2008	The COTRs shall distribute the final CIE reports to the Project Contact

Background References:

Turtle Expert Working Group. 1998. An Assessment of the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-409, 96 p.

Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-444, 115 p.

Acceptance of Deliverables:

Upon review and acceptance of the CIE reports by the CIE Coordinator and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE reports in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility to distribute the final CIE reports to the Project Contacts.

Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

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ANNEX 1

Format and Contents of CIE Independent Peer Review Report

- 1 The reviewer's report shall be prefaced with an executive summary of findings and/or recommendations.
- 2 The main body of the reviewer's report shall consist of a background, description of the review, summary of findings, and conclusions/recommendations. The summary of findings shall address each Term of Reference. Reviewers are also encouraged to provide any criticisms and suggestions for

improvement of the TEWG process.

3 The reviewer's report shall include as separate appendices the bibliography of materials provided for the review of the Loggerhead TEWG draft report and a copy of the CIE Statement of Work.

REVIEW OF TEWG 2008 NORTHWESTERN ATLANTIC LOGGERHEAD POPULATION ASSESSMENT

Report to the Center for Independent Experts

Daniel Goodman
Bozeman, MT 59717
September 30, 2008

INTRODUCTION

This is a review of:

TEWG. 2008. An Assessment of the Loggerhead Turtle Population in the Northwestern Atlantic Ocean. NMFS-SEFC-xxx.

In preparation for this review, I also read the following material:

Frazer, N.B. 1986. Survival from egg to adulthood in a declining population of loggerhead turtles, *Caretta caretta*. *Herpetologica* 42:47-57.

Heppell, S.S., L.B. Crowder, D.T. Crouse, S.P. Epperly, and N.B. Frazer. 2003. Population models for Atlantic loggerheads: past, present, and future. Ch 16. pp 55-274 in A.B. Bolten and B.E. Witherington, eds. "Loggerhead Sea Turtles." Smithsonian, Washington, DC.

TEWG. 1998. An Assessment of the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead

(*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NMFS-SEFC-409

TEWG. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. NMFS-SEFC-444

TEWG. 2007. An Assessment of the Leatherback Turtle Population in the Atlantic Ocean. NMFSSEFC-555

Hedges, M.E. 2007. Development and Application of a Multistate Model to the Northern Subpopulation of Loggerhead Sea Turtles (*Caretta caretta*). MS Thesis, Virginia Polytechnic

I also consulted an undated document from the NOAA website:

"Part I. Stock Assessment of Loggerhead Sea Turtles of the Western North Atlantic" by S.P. Epperly, M.L. Snover, J. Braun-McNeill, W.N. Witzel, C.A. Brown, L.A. Cszudi, W.G. Teas, L.B. Crowder, and R.A. Myers. (this document uses data through 2000, and cites references through 2001).

The CIE charge to the reviewers is to evaluate the TEWG 2008 document as an "assessment of status and trends of the population" and to evaluate the document's research recommendations. This is consistent with the document's title, as "an assessment of the...population," but the actual content of the document is considerably narrower than that. The executive summary of the document is narrower yet in its focus.

So, I will provide three levels of review:

- (a) An appraisal of the assertions made in the executive summary of TEWG 2008.
- (b) An appraisal of the other assertions made in the main text of TEWG 2008.
- (c) An appraisal of TEWG 2008 as a stock status assessment.

Along the way I will comment on the adequacy and appropriateness of the data and the methods of analysis for each of the three levels.

My recommendations, at the end, will address specific shortcomings of the present document and will also consider from a programmatic perspective the needs for a comprehensive assessment of the Northwestern Atlantic loggerhead sea turtle population.

EXECUTIVE SUMMARY OF TEWG 2008

The key message of the executive summary of TEWG 2008, stated up front in its first paragraph, is that current evidence is not consistent with the conclusion from TEWG 1998 that the main northwestern Atlantic population is "showing signs of recovery." This message is well supported by the evident decline in the annual nest count from the Florida nesting areas, which make up the bulk of the nesting and hatchling production of the Atlantic population (and a substantial fraction of the world population). A further seven pertinent points made in the executive summary are, in my own words, that:

- 1 The recent numbers of loggerheads nesting in Florida are lower than when standardized surveys began in 1989.
- 2 The annual numbers of loggerheads nesting in Florida show a strong declining trend since 1998.
- 3 Six stated hypotheses are worth considering to account for the decline in nest counts and to interpret its implications for the status of the population.
- 4 The available data do not allow "testing" of most of the six hypotheses, and so do not discriminate among them.
- 5 The analyses do conclude that adult female annual survival rates have not changed.
- 6 The role of pelagic longline bycatch in the decline is rendered less likely by the observation that rates of decline differ among the nesting assemblages.
- 7 More research is needed.

Points 1, 2 and 4 are well supported by the information presented in the body of the document. The six stated hypotheses which form the content of point 3 are relevant and reasonable enough, but the set of hypotheses, and their discussion, leaves out the important and obvious conclusion (perhaps this should be Hypothesis H_7) that the decline in nest counts does directly imply a declining trend in reproductive output of the population. All other things being equal, this decline in population reproduction will lead to declines in recruitment and to further declines in nest counts when the births from the current era reach reproductive age two or three decades in the future.

Point 5 is not supported by the information presented in the body of the document. The mark recapture

survival estimates discussed on pages 84-85 do not specifically compare estimates from the period pre-1998 and post-1998 with consistent models on strictly comparable data; nor is there any indication that the survival estimates from the mark recapture analysis have the statistical power to resolve survival differences of the minimal magnitude which could account for the declining nest counts. Overall, the mark recapture survival estimation is poorly documented, and I am concerned that the models used are over-complicated relative to the information content of the data.

The logic of point 6 is flawed. The conclusion that pelagic longline bycatch is unlikely to be a major factor in the decline, because the rate of decline differs among the different nesting assemblages, assumes that the different nesting assemblages all have the same exposure to the pelagic longline fisheries, and all suffer the same mortality rates from other causes. This assumption is obviously undermined by the possibility that turtles from the different nesting assemblages could have different foraging distributions in time and space. And it is also undermined by the possibility that other mortality factors could operate at different intensities among the respective nesting assemblages. The available information on nest site philopatry, genetic differentiation, and the general observation that, at least in the short term, locally exterminated subpopulations do not recolonize, all leave room for the possibility of spatial differences between nesting assemblages with respect to at sea exposures.

Point 7 is undeniable, and is a corollary of point 4. But the executive summary is a little vague about exactly what "research" is needed, or what critical "data" that research would provide. The main body of the text is a bit better in this respect, but still stops short of prioritizing the research needs or explaining exactly which data are needed to test which hypothesis adequately. In particular, the report fails to state explicitly that a considerable expansion and enhancement of observer programs will be needed to resolve the role of bycatch in affecting the status of the stock. In fact the word "observer" does not appear anywhere in the executive summary or the main body of the document, though there is an oblique reference to "observed fisheries" in the "Bycatch" section of the document (but not in the "Research Needs and Recommendations" section).

OTHER POINTS IN THE MAIN TEXT OF TEWG 2008

In addition to discussion of evidence bearing on the main points asserted in the executive summary, the main text presents a statistical analysis of the trend in the nesting count data and a population viability analysis. Neither is very well done, but neither is essential to the points made in the executive summary.

Statistical Trend Analysis

The "frequentist" trend analysis for the Florida nesting count data was done by log regression. No details are given, and the document cites Witherington, *et al.*, in press, which is not provided. Likewise, the description of the survey methodology for the "Statewide Nesting Beach Survey" and the "Index Nesting Beach Survey" is not provided, so the reviewer has to take it on faith that there are no artifacts owing to the survey method or the method of standardizing or the definition of the 28 "core nesting beaches."

The "Bayesian state space" analysis method is referenced to TEWG 2007, where it emerges that the likelihood function is not really a likelihood at all, but rather a vague prior on the probability that an adult female will nest and be sighted in any given year. This is not a satisfactory model.

Regardless of these shortcomings of the statistical analyses, it is clear on the face of it, from Figure 1 (p. 22), that there is a decline in the Florida nest counts and that the nature of the trajectory has changed midway. Again, only this figure is provided in the document, not a table of numbers, and the reference is to "Florida Fish and Wildlife Conservation Commission unpubl. data."

On inspection, the figure shows, for the interval 1989-1997, two obvious 4-yr cycles of an amplitude of about 15,000 and a slight increasing trend. On inspection, the figure shows for the interval 1998-2007 a strong and very consistent declining trend with numbers in 2004-2007 consistently below the 1989 starting number (and the starting value itself was a "low" in the apparent cycle). The numbers since 2001 have been consistently below the first cycle's peak. Actually, it is ambiguous when the "change point" occurred: The downward trend is quite consistent starting from 1998, but note that 1987-2001 could equally well be viewed as a third 4-yr cycle, in which case the first real departure from the previous pattern would be 2002. The downward trend looks linear enough in the original space, without log transforming.

Population Viability Analysis

The population viability analysis is not well explained in the document, with a reference only to "Snover and Heppell, in review," which is not provided. The basic model, the diffusion model of Dennis et al (1991), is not a good approximation to the stochastic mechanisms actually at work in a population with an age at maturity of something like 30 yrs, and hence a generation time of probably more than 30 yrs. The choice to smooth the raw nest count time series with a 3-year running mean does not address this issue, but it may cancel out some observation error variation (if that variation is primarily high frequency). The bootstrap approach of Morris and Doak (2002) is a little bit clumsy, and definitely not state of the art. If the loggerhead turtle program wants to invest in some Bayesian analysis, the PVA modeling (as distinct from the particular attempt at "state space modeling" to estimate the population trend) would be a good place. A Bayesian framework offers a much more natural way to merge parameter uncertainty with estimates of real process variation in a PVA. I did not understand the logic of the "SQE index" and its relation to critical values and "Type I" and "Type II" classification errors. No doubt a Bayesian alternative would help here as well.

TEWG 2008 AS A STOCK STATUS ASSESSMENT

The preface to TEWG 1998 states that the TEWG originated during the course of the 1995 Consultation requiring NMFS to form a team of experts to "compile and examine [in]formation on the status of sea turtle species....attempt to identify a) the maximum number of individual sea turtles of each species that can be taken incidentally to commercial fishing activities without preventing the recovery of the species, b) the maximum number of individuals that can be taken incidentally to commercial fishing activities without jeopardizing the continued existence of any listed sea turtle species, and c) the number of stranded sea turtles occurring in statistical zone that indicate incidental takes are occurring at levels beyond those authorized." None of (a), (b) or (c) has been accomplished yet. TEWG 1998 and TEWG 2000 proposed provisional numbers for (c), called Interim Stranding Limits, and assessed whether these were being exceeded. TEWG 2000 considered, but did not endorse, PBR as an approach to estimating (a) and (b). None of this is mentioned in the present document.

In this respect, and in some others, both TEWG 1998 and TEWG 2000 are more comprehensive assessments than the current document, TEWG 2008. TEWG 1998 and TEWG 2000, for example, presented some rough quantitative estimates of bycatch. TEWG 2008 declines to do so, but it does not explicitly disavow the previous estimates either.

Now, the current document does present an important new finding--a declining trend in nest counts--and states an important new conclusion-- that there is no longer an appearance of progress toward recovery. What is missing from the present document is a statement of what other conclusions from TEWG 1998 and TEWG 2000 have been superceded, and what conclusions still stand. So it is not clear whether TEWG 2008 is intended as a stand alone stock status assessment, or whether TEWG 1998 and TEWG 2000 and TEWG 2008 are to be understood together to constitute "the stock assessment."

None of the three TEWG assessments has really done a synthesis, integrating all the data, or considering the combined effects of all the factors (including quantification of nesting beach protection and hatchery operations and TED adoption) operating over the past 30 years since listing. I doubt that such a synthesis will be very conclusive given the limitations of the data, but it should still be tried.

REVIEWER'S RECOMMENDATIONS

Short Term

To bring the present document up to a reasonable standard:

- * Explain carefully the relationship between the present document TEWG 2008, and the former assessments in TEWG 1998 and TEWG 2000.
- * Better assess the implications of the decline in nest counts for the future of the population over the next 30 years.
- * Prioritize the Research Needs and be more explicit about what data are needed to answer what question, and be more explicit about how those data are to be obtained, and what sample sizes and precision are required to deliver an adequate answer.
- * Specifically explain what is needed to resolve the question of the role of bycatch, and be sure

that this point makes it into the Executive Summary.

- * Better document the nest count data.
- * Better document the trend analysis of the nest count data.
- * Drop the Bayesian state space analysis (or if a more reasonable likelihood model, supported by actual data, is ready for use, then redo that analysis).
- * Better document the population viability analysis and explain its real usability (or perhaps just drop it).
- * Better document the data used for the adult female survival rate analysis, and make those data accessible for reviewability.
- * Better document the adult female survival analysis, provide meaningful diagnostics, and revisit the claim (now in the Executive Summary) that the adult female survival rate has not changed.

Long Term

For the longer term, the program needs to:

- * Greatly intensify marking operations.
- * Design and implement a mark resighting and carcass recovery system appropriate to the estimation of survival rates, reproductive rates, and population size.
- * Compile a well documented data base of all the data.
- * Initiate an integrated modeling and statistical analysis effort to synthesize all the information for a more comprehensive assessment.

Finally, from my reading of TEWG 2008 and background material, I get the impression that the turtle program might benefit from a programmatic review.

REVIEWER'S SUMMARY

The new and central finding of TEWG 2008 is that, based on evidence since 1989, the main northwestern

Atlantic loggerhead population is not showing signs of recovery, and the trend in nest counts is declining. This important claim is fully justified by the information presented. In some other respects, however, the TEWG 2008 document is rather weak as a "stock status assessment."

Appendix I: Statement of Work for Dr. Dan Goodman
External Independent Peer Review by the Center for Independent Experts
Loggerhead Turtle Expert Working Group Report

TEWG Project Overview

The National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC) convened a Loggerhead Turtle Expert Working Group (TEWG) to assess the status of loggerhead turtles in the North Atlantic Ocean. Scientists from NMFS, NGOs, and academia with expertise in loggerhead biology and data analysis comprised this group. All members contributed their expertise to the group, with the goal of producing a draft report that assesses loggerhead status in the Atlantic.

The TEWG concept was established by the SEFSC at the behest of NMFS in 1995 to assess the status of turtle species in the Atlantic. Previous TEWG reports addressed loggerhead turtle status in 1998 (TEWG 1998) and 2000 (TEWG 2000). The current loggerhead TEWG was initiated to address the recent declines in loggerhead nest in the U.S. The TEWG met in December 2006, April 2007, and September 2007. The SEFSC has the lead for conducting stock assessments on Atlantic sea turtles, and assembled an international group of government scientists, academics, and NGOs to assess the status of loggerheads.

Overview of CIE Peer Review Process:

The Office of Science and Technology implements measures to strengthen the NMFS Science Quality Assurance Program (SQAP) to ensure the best available high quality science for fisheries management. For this reason, the NMFS Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent

peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

Requirements for CIE Reviewers:

Three CIE reviewers are required to conduct a desk review (no travel is required) of a Loggerhead TEWG draft report (approximate length 120 pages), and each reviewer's duties shall occupy a maximum of 5 days to conduct the peer review and produce a CIE independent peer review report.

The CIE reviewers shall have expertise with current quantitative skill as it relates to an understanding of life histories and stock assessment of large, long-lived, highly migratory marine vertebrates. CIE reviewers shall expertise and experience with generating stock assessments in a data poor situation and in the use of count data as proxies for population size (e.g., number of nests for this report) and population growth rates. The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR herein.

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct an independent peer review of the TEWG loggerhead stock assessments to determine whether the best possible assessment was utilized through the TEWG process. The CIE reviewers shall conduct preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and deliverable dates as specified. The reviewers shall evaluate the draft North Atlantic assessment report of the Loggerhead TEWG. Their primary responsibility is to conduct an impartial peer review to ensure that assessment results are based on sound science, and the CIE reviewers shall not comment on management decisions. The reviews shall consider whether the input data, assessment methods, and results are adequate and support the conclusions. If a reviewer finds the assessment to be deficient, then he/she shall recommend remedial measures, including an appropriate approach for correcting and subsequently reviewing the assessment. The evaluation shall explicitly address the following Terms of Reference.

Terms of Reference:

- 1 Evaluate the adequacy, appropriateness, and application of data used in the assessment.
- 2 Evaluate the general adequacy, appropriateness, and application of methods used in the assessment.
- 3 Evaluate the adequacy, appropriateness, and application of the methods used to assess population status and trends.

4 Review research recommendations provided in the report and make any additional recommendations warranted.

5 Prepare a Peer Review Report as described in Annex 1, summarizing the CIE Reviewer's evaluation of the Loggerhead TEWG report and addressing each Term of Reference, including a statement on whether the assessment was based on sound science, appropriate methods, and appropriate data, with a copy each sent to Dr. David Sampson at david.sampson@oregonstate.edu and Mr. Manoj Shivilani at shivlanim@bellsouth.net.

Schedule of Milestones and Deliverables:

27 March 2008	CIE shall provide the COTR with the CIE reviewer contact information, which shall then be sent to the Project Contact
11 April 2008	The Project Contact shall send the CIE Reviewers the Loggerhead TEWG report
25 April 2008	Each reviewer submit independent peer review report to CIE
8 May 2008	CIE shall submit draft CIE independent peer review reports to the COTRs
22 May 2008	CIE shall submit final CIE independent peer review reports to the COTRs
28 May 2008	The COTRs shall distribute the final CIE reports to the Project Contact

Background References:

Turtle Expert Working Group. 1998. An Assessment of the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-409, 96 p.

Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-444, 115 p.

Acceptance of Deliverables:

Upon review and acceptance of the CIE reports by the CIE Coordinator and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE reports in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility to distribute the final CIE reports to the Project Contacts.

Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

William Michaels, COTR, NMFS Office of Science and Technology, 1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910

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Contractor Contacts:

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Project Contact:

Christopher Sasso, TEWG Coordinator, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149

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ANNEX 1

Format and Contents of CIE Independent Peer Review Report

- 1 The reviewer's report shall be prefaced with an executive summary of findings and/or recommendations.
- 2 The main body of the reviewer's report shall consist of a background, description of the review, summary of findings, and conclusions/recommendations. The summary of findings shall address each Term of Reference. Reviewers are also encouraged to provide any criticisms and suggestions for improvement of the TEWG process.
- 3 The reviewer's report shall include as separate appendices the bibliography of materials provided for the review of the Loggerhead TEWG draft report and a copy of the CIE Statement of Work.